

Energy

Key Information	Why is this Useful?	What is Happening?
Total energy consumption for Christchurch.	This measures the total amount of energy used by the City.	↑ Total energy consumption increased by 17 per cent between 1990 and 1997 to 24,669 tera joules.
Per capita energy consumption.	This takes into account the effect population change has on energy consumption. Population growth results in an increase in total energy use. Decreasing per capita consumption reflects increases in efficiency and energy conservation.	↑ Per capita consumption increased by 5 per cent to 77 giga joules between 1990 and 1997
Renewable versus non-renewable energy consumption.	This measures the proportion of the City's energy consumption that comes from renewable sources, and how reliant the City is on fossil fuels.	- The proportion of renewable to non-renewable energy consumption did not change between 1990 and 1997.
Energy use by the transportation sector.	Transportation accounts for 50 per cent of the total energy consumed in Christchurch. Almost all modes of transport in the City use fossil fuels, which contribute to greenhouse gas emissions and reduced street level air quality.	↑ Transportation energy consumption increased by 29 per cent between 1990 and 1997.
Commercial/industrial energy consumption.	This measures the amount of energy used in production and provision of goods and services. This would be more meaningful if it could be related the City's economic output, as it would measure the efficiency in the production of goods and services.	↑ Energy consumption in the industrial and commercial sector increased by 7 per cent between 1990 and 1997.
Domestic energy consumption per capita.	This measures the effectiveness of residential energy conservation and efficiency, and changing individual behaviour towards energy use.	↓ Per capita energy consumption decreased by 8 per cent between 1990 and 1997.
Expenditure on domestic energy.	This shows the proportion of household expenditure on energy and gives a general measure of the affordability of domestic energy. This excludes transportation.	● Average household expenditure on energy was approximately \$1,200 per year in 1997.

Other Related Sections: Population Growth, Air Quality, Health, Built Environment, Urban Amenity, Transportation, Businesses, Employment and Unemployment.

Energy is used whenever we undertake an activity. However, it is the services we obtain from energy, such as heat, light and motive power, which are important rather than the energy itself. Energy resources, whether renewable, such as hydro-electricity and wood, or non-renewable such as oil, gas or coal, are limited at any point in time. Non-renewable resources are finite and cannot be replaced, whereas renewable resources such as hydro-electricity are limited by the amount of water storage available for generation.

Present rates of consumption of non-renewable energy sources cannot be sustained indefinitely. In addition, some forms of energy have adverse effects on the environment. Fossil fuels produce greenhouse gases which are linked to global climate change. Some fuels also produce emissions which have adverse effects on human health and the environment, and contribute to Christchurch's air quality problems.

Recognition of the future costs and availability of energy, and of the adverse effects of energy use on the environment, has increased the need for energy conservation and efficiency and a change to more environmentally-friendly energy sources.

Total Energy Consumption

Energy consumption within Christchurch City was estimated to be 24,669 tera joules⁴² for the 1997 year⁴³. On a per capita basis this was around 77 giga joules (GJ) per person, considerably lower than the 108 GJ/capita and 113 GJ/capita⁴⁴ for Canterbury and New Zealand respectively. Higher per capita energy consumption in Canterbury and nationally can possibly be explained by the higher energy use in rural areas, and the fact that Christchurch has few heavy industries that are energy intensive. In general, urban areas are also relatively energy efficient due to shorter travel distances.

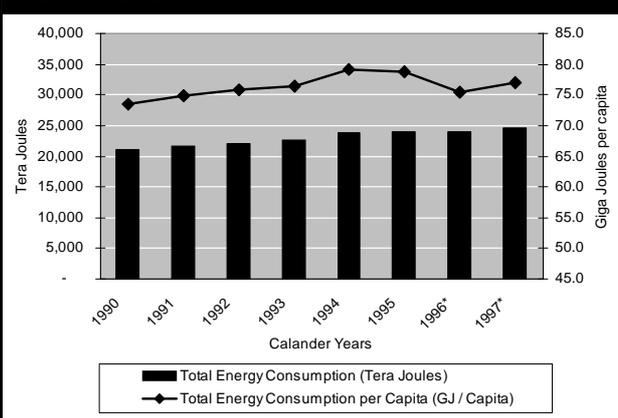
Total energy consumption in the City grew by 17 per cent between 1990 and 1997. Growth in population could account for 12 per cent of this growth, with increasing energy consumption responsible for the remaining five per cent or 1,050 tera joules (Figure 2.36).

⁴² A Joule is a unit of energy. Mega Joule(MJ) is one million joules(1x 10⁶); Giga Joules (GJ) is one thousand million joules (1x10⁹), Tera joule(TJ) is one million, million joules (1x10¹²).

⁴³ This was the most recent period with complete records for all energy sources. Energy consumption information provided by Canterbury Regional Council.

⁴⁴ Ministry of Commerce, Energy Modelling and Statistics Unit, Energy Data Figures 1999.

Fig 2.36 Estimated Total Energy Consumption for Christchurch



Source: Canterbury Regional Council.

Energy by Type

Figure 2.37 shows the proportion of each type of fuel used in Christchurch in 1997. Petrol and electricity dominated energy consumption. Combined, they provided around two thirds of the energy used in the City. Diesel use increased by 83 per cent between 1990 and 1997 and accounted for almost 20 per cent of total energy consumption in 1997. Part of this increase can be attributed to the increase in diesel-powered motor vehicles imported into New Zealand since 1990. The number of new diesel vehicles registered during this period increased by 125 per cent in the Christchurch postal area.

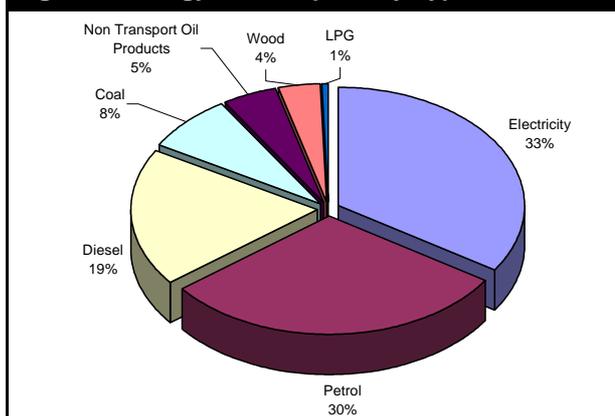
Almost two thirds of Christchurch's energy consumption (61.3 per cent) was from non-renewable energy sources, with 38.3 per cent from renewable sources such as electricity and wood. This proportion remained stable for much of the 1990s and is comparable to the national proportion of renewable energy of 33.1 per cent. However, growth in non-renewable energy consumption increased in real terms by 16 per cent from 1990.

Preferences for individual energy sources have changed. For example, domestic coal use declined by 25 per cent between 1990 and 1997. However, this only represents a real decrease from 1.6 to 0.9 per cent of the total energy consumed. The change in the consumption pattern has not resulted in increased use of renewable energy sources but has been offset by the growth in other non-renewable energy sources such as diesel.

Energy by Sector

Figure 2.38 shows energy consumption by sector. The transport sector, which used the highest proportion of energy, accounted for around 50 per cent of the total energy consumed. Between 1990 and 1997 consumption in this sector increased from 9,425 tera joules, or 76 per cent of the total growth in energy consumption for this period. (Unfortunately the transportation sector cannot be separated into commercial and private energy consumption.) The

Fig 2.37 Energy Consumption by Type, 1997



Source: Canterbury Regional Council.

commercial and industrial sector and domestic sector used 30 and 21 per cent of the City's total energy respectively.

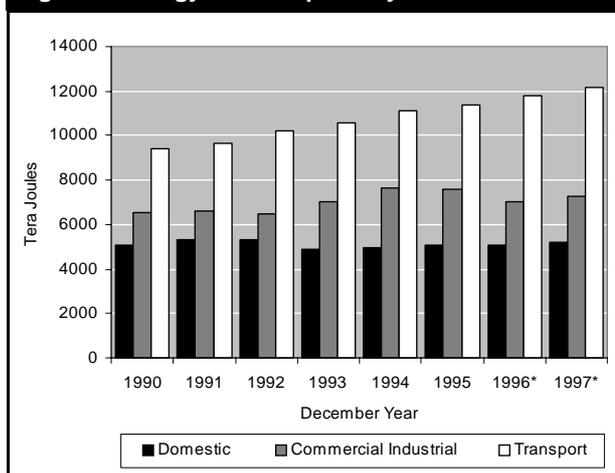
Transportation energy consumption was dominated by the use of petrol, which made up 61 per cent of total transportation consumption (Figure 2.39). Diesel contributed 38 per cent and LPG comprised the remaining 1 per cent. Petrol consumption has steadily increased.

The trend in diesel consumption showed no change up to 1991. However, between 1991 and 1997, diesel use increased by 73 per cent. This change in trend can be explained by changes in road transport policy and purchasing behaviour by motorists.

Commercial and industrial consumption remained at around 30 per cent of total energy consumption. In real terms there was a 7 per cent increase in energy consumption between 1990 and 1997.

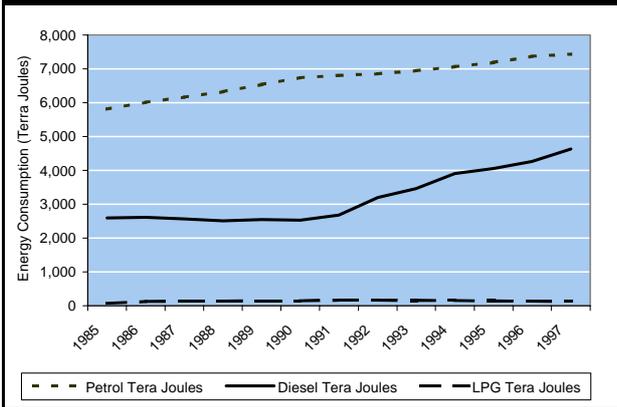
Total domestic energy consumption increased by 2 per cent over this period. The rise is encouraging considering the population grew by 7 per cent between the 1991 and 1996 census periods. Consequently, per capita domestic consumption decreased from 18

Fig 2.38 Energy Consumption by Sector



Source: Canterbury Regional Council.

Fig 2.39 Estimated Christchurch Vehicle Energy Consumption



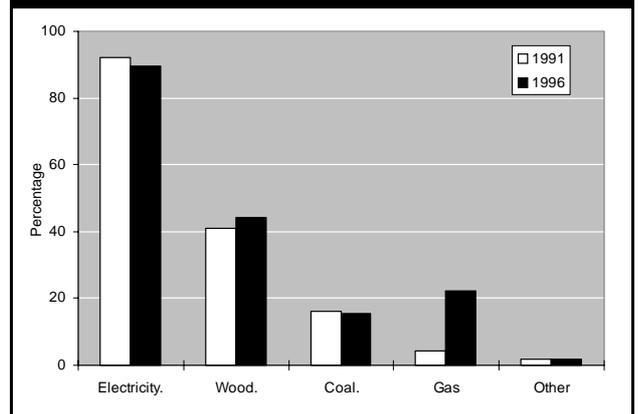
Source: Canterbury Regional Council.

GJ/person to 16 GJ/person between 1990 and 1997. This trend reflects improvements in house construction and insulation, and increased energy conservation.

The types of fuel used for domestic heating in Christchurch were surveyed by Statistics New Zealand in the 1996 Census of Population and Dwellings. Figure 2.40 shows that electricity continued to be the most common form of energy used to provide heating⁴⁵. Ninety per cent of householders used electricity to heat their house, with wood being used in 45 per cent of homes. The most notable change in heating behaviour was the increase in gas heating from 4.5 per cent in 1991 to over 20 per cent in 1996. This can be partially attributed to the increased use of portable gas heaters during this period.

Statistics New Zealand also collects information on the average household expenditure on domestic energy as part of its Household Economic Survey. For the years to March 1997 and March 1998, the average annual household expenditure on domestic power and fuel, excluding transportation fuels, was \$1,239 and \$1,201 respectively. Of this, electricity made up about 90 per cent of the expenditure, firewood 5 per cent, and other fuels such as CNG and LPG the remainder.

Fig 2.40 Means of Heating in Private Dwellings



Source: Statistics New Zealand, Census of Population and Dwellings.

⁴⁵ Dwellings may use more than one form of heating, therefore the percentages will not add to 100.